

WAFER MAKER PUSHES THE SPEED LIMIT

A low-cost, high-speed tool enables large-scale production of compound semiconductor-based devices for photonic and electronic applications.



■ EMCORE has developed a high-volume nitride deposition tool that combines multiwafer capabilities and patented TurboDisc™ metal-organic chemical vapor deposition technology (pictured above).

Compound semiconductor materials are attractive for new electronic devices because, unlike silicon, they can be tailored for optical and high-frequency applications. Typically, electronics manufacturers have met the needs of research and pilot production of compound semiconductor layers with in-house systems and technologies. However, producing commercial volumes of starting material often exceeds the capabilities of in-house solutions.

EMCORE Corporation (Somerset, NJ) has developed a process technology called TurboDisc™ that is key to the low-cost, high-volume production of compound semiconductors. This technology not only ensures uniformity of deposition across the wafer to produce better yields, it also allows users to scale easily from research to commercial volumes with substantially reduced time and effort. TurboDisc tools can prepare compound semiconductor wafers from 2 inches to 14 inches in diameter in a variety of material combinations.

EMCORE's technology uses a unique high-speed rotating disk in a stainless-steel growth chamber to decompose reactive gases and deposit ultrathin layers of materials (metals, conductors, oxides) on a substrate wafer. Layers grown by TurboDisc deposition allow for the design of circuits and devices that are faster and denser, have photonic capabilities, and possess properties superior to those manufactured using traditional techniques. BMDO's SBIR program funded early work at EMCORE to optimize the TurboDisc system for gallium arsenide film growth and subsequently funded EMCORE's initial research in large area growth of compound semiconductors, most notably gallium nitride.

Low-cost volume production. TurboDisc makes possible cost-effective metal-organic chemical vapor deposition (MOCVD) production systems for producing commercial volumes of high-performance compound semiconductor wafers and devices. "This technology addresses the critical need of electronics manufacturers to cost-effectively get to the market faster with higher volumes of new and improved high-performance products," says Dr. Ian Ferguson, EMCORE's director of contract research. "It's an important breakthrough that transitions MOCVD technology out of the laboratory into the production environment."

TurboDisc technology has enabled EMCORE to become the leading manufacturer of production systems used to fabricate compound semiconductor wafers.

In fiscal year 1997, a majority of the company's \$47.8 million in revenues resulted from TurboDisc technology. In March of that year, EMCORE announced an initial public offering of 2.5 million shares of its common stock at \$9 per share. The company raised over \$20 million in proceeds, most of which will be used to expand its manufacturing facility.

TurboDisc systems are being used by some of the world's leading semiconductor companies, including Siemens, Hewlett-Packard, and Samsung. These systems come in a variety of platforms: Enterprise for volume production, Discovery for pilot production, and Explorer for research. EMCORE also offers customers the Epimetric *in situ* photoreflectance system to monitor the growth rate and thickness uniformity of a broad range of materials.

Bright blues. EMCORE's commercialization of BMDO-funded research and development has aided the development of commercial ventures in gallium nitride (GaN). The company recently introduced SpectraBlue, a TurboDisc designed specifically for the production of layers for very bright blue light-emitting diodes (LEDs) and blue lasers. In addition, it recently has entered a joint venture with the newly formed Uniroyal Optoelectronics Division of Uniroyal Technology Corporation to produce high-brightness LED epitaxial wafers, lamps, and display devices. The initial focus of the venture will be on the manufacture of GaN devices.

EMCORE's expansion into wafer and package-ready device production has been spurred almost entirely by requests from customers whose wafer needs exceed their available in-house production capabilities. For example, the company has formed a strategic relationship with General Motors Corporation to develop and manufacture magnetoresistive sensor products for use in automotive applications. It has also been involved in the development of solar cell technologies for telecommunications satellites and transmitter and display technologies for wireless communications applications.

The support EMCORE received under the BMDO SBIR program has helped motivate the company to achieve landmark results, which have recently been acknowledged by the U.S. Small Business Administration (SBA) and New Jersey Technology Council (NJTC). This year, the SBA presented EMCORE with its Tibbetts Award for superior SBIR technological innovation, economic impact, and business achievements. NJTC selected EMCORE as its Product Development Company of the Year for 1998.

■ For more information, contact Dr. Ian Ferguson via telephone at (732) 271-9090, ext. 4114, or via E-mail at ianf@emcore.com. You can also visit EMCORE's Web site at <http://www.emcore.com>.



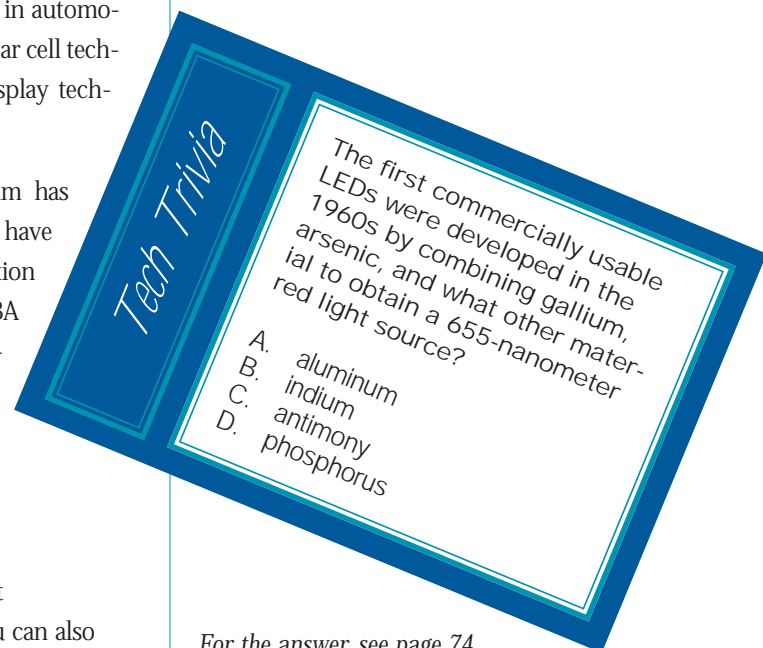
What Does It Mean to You?

Because TurboDisc systems can reduce manufacturing costs and increase production rates for compound semiconductor devices, they will allow more affordable cellular telephones, pagers, flat-panel displays, and electronic automotive components.



What Does It Mean to Our Nation?

TurboDisc systems are helping U.S. electronics and optoelectronics manufacturers, such as AT&T, Honeywell, and Uniroyal, to cost-effectively get to market faster with high volumes of new and improved high-performance products.



For the answer, see page 74.